

【CLAIMS】

【Claim 1】

A phosphor having the chemical formula: $\text{Sr}_{4-x}\text{Mg}_y\text{Ba}_z\text{Si}_2\text{O}_8:\text{Eu}^{2+}_x$
($0 < x < 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$).

【Claim 2】

The phosphor of claim 1, wherein the average particle size of the phosphor is less than 20nm.

【Claim 3】

The phosphor of claim 1, wherein the average particle size of the phosphor is 5 to 15nm.

【Claim 4】

The phosphor of claim 1, wherein the phosphor is excited by the light generated from a compound semiconductor to have a main peak ranging from 500 to 600nm.

【Claim 5】

The phosphor of claim 1, wherein the phosphor is excited by the light having a main peak ranging from 400 to 480nm to have a main emission peak ranging from 500 to 600nm.

【Claim 6】

The phosphor of claim 1, wherein a main emission peak of the phosphor shifts according to the concentration of Eu^{2+} .

【Claim 7】

The phosphor of claim 1, wherein the mole concentration of

Eu²⁺ is 0.02 to 0.20 mol.

【Claim 8】

A light emitting device including a phosphor, comprising:
a light source;
a support for supporting the light source;
a light transmitting member provided at least one portion around the light source; and

a phosphor having a chemical formula: $\text{Sr}_{4-x}\text{Mg}_y\text{Ba}_z\text{Si}_2\text{O}_8:\text{Eu}^{2+}_x$ ($0 < x < 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) incorporated in the light transmitting member.

【Claim 9】

The light emitting device of claim 8, wherein the concentration of Eu²⁺ is 0.02 to 0.20 mol.

【Claim 10】

The light emitting device of claim 8, wherein the light transmitting member is a molding member.

【Claim 11】

The light emitting device of claim 8, wherein the mixing ratio of the phosphor with respect to the light transmitting member is 5 to 50 wt%.

【Claim 12】

The light emitting device of claim 8, wherein the light transmitting member is molded entirely around the light emitting

device.

【Claim 13】

The light emitting device of claim 8, wherein the light transmitting member is molded partially around the light emitting device.

【Claim 14】

The light emitting device of claim 8, wherein white light is emitted by the light emitted from the light source and the light excited by the phosphor.

【Claim 15】

The light emitting device of claim 8, wherein the concentration of Eu^{2+} included in the phosphor is 0.02 to 0.20 mol.

【Claim 16】

The light emitting device of claim 8, wherein in a case where the light emitting device is a top view type, the concentration of Eu^{2+} is 0.02 to 0.10 mol.

【Claim 17】

The light emitting device of claim 16, wherein the content of the phosphor with respect to the light transmitting member is 10 to 30 wt%.

【Claim 18】

The light emitting device of claim 8, wherein in a case

where the light emitting device is a side view type, the concentration of Eu^{2+} included in the phosphor is 0.08 to 0.15 mol.

【Claim 19】

The light emitting device of claim 18, wherein the content of the phosphor with respect to the light transmitting member is 5 to 20 wt%.

【Claim 20】

The light emitting device of claim 8, wherein in a case where the light emitting device is used as a white light source of a backlight, the concentration of Eu^{2+} included in the phosphor is 0.02 to 0.10 mol, and the content of the phosphor with respect to the light transmitting member is 15 to 50 wt%.

【Claim 21】

The light emitting device of claim 8, wherein in a case where the light emitting device is used as a blue light source of a backlight, the concentration of Eu^{2+} included in the phosphor is 0.02 to 0.10 mol, and the content of the phosphor with respect to the light transmitting member is 10 to 40 wt%.

【Claim 22】

The light emitting device of claim 8, wherein the light source is a gallium nitride light emitting diode.

【Claim 23】

A lamp type light emitting device including a phosphor, comprising:

- a light source;
- a support for supporting the light source;
- a molding member provided at least one portion around the light source; and

a phosphor having a chemical formula: $\text{Sr}_{4-x}\text{Mg}_y\text{Ba}_z\text{Si}_2\text{O}_8:\text{Eu}^{2+}_x$ ($0 < x < 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) incorporated in the molding member.

【Claim 24】

A surface mounting type light emitting device including a phosphor, comprising:

- a light source;
- a support for supporting the light source;
- a molding member provided at least one portion around the light source; and

a phosphor having a chemical formula: $\text{Sr}_{4-x}\text{Mg}_y\text{Ba}_z\text{Si}_2\text{O}_8:\text{Eu}^{2+}_x$ ($0 < x < 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) incorporated in the molding member.

【Claim 25】

A method for producing a phosphor, comprising the steps of:

- providing the stoichiometric quantities of an oxygen compound of at least one element selected from the group consisting of strontium (Sr), magnesium (Mg) and barium (Ba) and an oxygen compound of europium;

- mixing the oxygen compounds; and

thermally treating the mixture to convert the same into a silicate phosphor including europium activated with rare earth ions.

【Claim 26】

The method of claim 25, further comprising the step of adding at least one fluxing compound selected from the group consisting of boride, chloride and fluoride after the oxygen compounds are mixed.

【Claim 27】

The method of claim 25, wherein the oxygen compounds are mixed using a small amount of solvent selected from the group consisting of distilled water, alcohol and acetone, and then dried at 100 to 400°C.

【Claim 28】

The method of claim 25, wherein the thermal treatment step is carried out under a mixture gas atmosphere of nitrogen and hydrogen, and the volume ratio of nitrogen and hydrogen is preferably 75 to 98:25 to 2.

【Claim 29】

The method of claim 25, wherein the thermal treatment step is carried out at 800 to 1500°C.